

1. A method for reducing defect levels in photomasks comprising:
  - providing a photomask having patterned metal layers;
  - treating the photomask to a cleaning process consisting of:
    - a solution of ammonium hydroxide, hydrogen peroxide and water maintained at a constant temperature;
    - ultrasonic agitation; and
    - an exposure time greater than 6 minutes;
  - removing particles and residues greater than about 0.2 microns while removing a minimal amount of patterned metal layer or layers; and
  - exercising the cleaning process on a particular photomask for a multiple number cleaning cycles without degradation of the photomask.
2. The method of Claim 1 wherein the ratio of reagents ammonium hydroxide:hydrogen peroxide:water of the cleaning solution is from about 1:1:200 to about 1:1:20 respectively by volume.
3. The method of Claim 1 wherein the minimal amount of metal layer or layers removed during cleaning results in less than 6.3% increase in optical transmission.
4. The method of Claim 1 wherein the constant temperature range of the cleaning solution is from about 15 degrees centigrade to about 60 degrees centigrade.
5. The method of Claim 1 wherein the pH of the cleaning solution is maintained at an alkaline level above a value of about 8.
6. The method of Claim 1 wherein the number of multiple cleaning cycles exercised on a particular photomask without degradation is greater than about ten cleaning cycles.
7. A method for attenuating yield loss in fabrication of microelectronics fabrications employing phase shift photomasks by reducing defect levels in said photomasks comprising:
  - providing a phase shift photomask having patterned metal layers;

providing a phase shift photomask having patterned metal layers;

treating the phase shift photomask to a cleaning process consisting of:

a solution of ammonium hydroxide and hydrogen peroxide in water  
maintained within a constant temperature range;

ultrasonic agitation;

an exposure time greater than about six minutes;

removing particles greater than about 0.2 microns while removing a minimal amount  
of patterned metal layers; and

exercising the cleaning procedure on a particular phase shift photomask for a  
multiple number of cleaning cycles without degradation of the phase shift photomask.

8. The method of claim 7 wherein the phase shift mask is formed of patterned layers of chromium  
and molybdenum silicon alloy.

9. The method of Claim 7 wherein the ratio of reagents ammonium hydroxide:hydrogen  
peroxide:water in the cleaning solution ranges from about 1:1:200 to about 1:1:20 by volume  
respectively.

10 The method of Claim 7 whereby the minimal amount of metal layers removed by the cleaning  
process is equivalent to less than about 6.3% increase in optical transmittance.

11. The method of Claim 7 whereby the constant temperature range of the cleaning solution is from  
about 15 degrees centigrade to about 60 degrees centigrade.

12. The method of Claim 7 wherein the pH of the cleaning solution is maintained at an alkaline  
level greater than a value of about 8.

13. The method of claim 7 wherein the number of cleaning cycles which may be exercised on a  
particular phase shift photomask without degradation is greater than ten cycles.